We claim:

1. A system for controlling the speed of an AC electric motor connected to a cyclical load, the system comprising:

a signal conversion circuit to convert an AC electric signal to a DC electric signal;

a signal measurement circuit to derive from the DC electric signal, a DC electric characteristic signal corresponding to a motor attribute;

a control circuit responsive to the DC electric characteristic signal and a set point parameter to generate control signals; and

a signal inversion circuit to generate drive signals in accordance with the control signals that modify the speed of the AC electric motor in response to indicated changes in the motor attribute to correspond to the set point parameter.

2. The system of claim 1 in which the signal measurement circuit senses the DC electric signal at a selected sampling frequency to derive the DC electric characteristic signal.

3. The system of claim 1 in which the motor attribute is representative of a change in motor voltage resulting from a change in motor load presented by the cyclic load as it is moved by the motor.

4. The system of claim 1 in which the motor attribute is representative of a change in motor current resulting from a change in motor load presented by the cyclic load as it is moved by the motor.

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5. The system of claim 1 in which the motor attribute is representative of a change in motor voltage resulting from a change in motor load presented by the cyclic load as represented by a load profile.

6. The system of claim 1 in which the motor attribute is representative of a change in motor current resulting from a change in motor load presented by the cyclic load as represented by a load profile.

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7. The system of claim 1 in which the control circuit is provided a torque set point as a set point parameter and derives a torque reference signal used to derive the control signals representative of a determined adjustment to a dimension of the drive signals generated by the signal inversion circuit to selectively drive the motor.

8. The system of claim 1 in which the control circuit is provided a target torque range as a set point parameter and derives a speed reference signal used to derive the control signals representative of a determined adjustment to a dimension of the drive signals generated by the signal inversion circuit to selectively drive the motor.

8 ~~9~~. The system of claim 7 in which the dimension of the drive signals is frequency.

9 ~~10~~. The system of claim 7 in which the dimension of the drive signals is voltage.

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11. The system of claim 8 in which the dimension of the drive signals is frequency.

12. The system of claim 8 in which the dimension of the drive signals is voltage.

13. The system of claims 7 and 8 in which the set point parameter is determined by evaluation of the motor driving the cyclic load in an unregulated mode.

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14. A method for controlling speed of a variable drive system driven AC electric motor connected to a cyclic load, the method comprising the steps of:

converting an AC electric signal to a DC electric signal;

deriving a set of DC electric characteristic signals from the DC electric signal;

generating first and second sets of control signals in response to the set of DC electric characteristic signals and a set point parameter; and

inverting the DC electric signal in response to the first and second sets of control signals to generate a set of drive signals to modify the speed of the AC electric motor in response to indicated changes in the motor attribute to correspond to the set point parameter.

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~~15~~. The method of claim 10 ~~14~~ in which the step of deriving the set of DC electric characteristic signals from the DC electric signal further comprises the step of:

sensing the DC electric signal at a selected sampling frequency having a time period to produce the set of DC electric characteristic signals which includes a DC current signal and a DC voltage signal.

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~~16~~. The method of claim 11 ~~15~~ in which the step of generating first and second sets of control signals further comprises the step of:

deriving a first reference signal from the set operational parameters.

~~17. The method of claim 16 in which the step of generating first and second sets of control signals further comprises the step of:~~

~~storing the DC current signal magnitude and deriving a desired parameter signal from the sensed DC voltage signal and the voltage-frequency profile in each of the time period of the selected sampling frequency.~~

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~~18. The method of claim 17 in which the step of generating first and second sets of control signals further comprises the step of:~~

~~comparing the DC current signal with the first reference signal and the stored DC current signal magnitude and comparing the desired parameter signal with the second reference signal for modifying the speed of the AC electric motor.~~

18 ~~19~~. The method of claim 17 ~~18~~ in which the step of inverting the DC electric signal in response to the first and second sets of control signals to generate the set of drive signals further comprises the step of:

maintaining a substantially constant motor torque at the set point parameter indicative of constant torque by generating and selectively applying the set of drive signals to the AC electric motor.

19 ~~20~~. The method of claim 18 ~~19~~ in which the step of inverting the DC electric signal in response to the first and second sets of control signals to generate the set of drive signals further comprises the step of:

driving the AC electric motor at a progressively decreased speed while the DC current signal is greater than the previously stored magnitude of the DC current signal by modifying the frequency of the set of drive signals with the first set of control

signals and modifying the voltage amplitude of the set of drive signals with the second set of control signals.

20 ~~21~~. The method of claim 18 ~~19~~ in which the step of inverting the DC electric signal in response to the first and second sets of control signals to generate the set of drive signals further comprises the step of:

driving the AC electric motor at a progressively increased speed while the DC current signal is less than the previously stored magnitude of the DC current signal by modifying the frequency of the set of drive signals with the first set of control signals and modifying the voltage amplitude of the set of drive signals with the second set of control signals.

22. The method of claim 14 in which the step of generating first and second sets of control signals further comprises the step of:

receiving the set of operational parameters, the voltage-frequency profile, and the set point parameter.

23. The method of claim 14 in which the step of generating first and second sets of control signals further comprises the step of:

pre-loading the set of operational parameters, the voltage-frequency profile, and the set point parameter.

13 ~~24~~. A method for controlling speed of an AC electric motor connected to a cyclic load, the method comprising the steps of:

converting with a signal conversion circuit an AC electric signal to a DC electric signal;

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deriving with a signal measurement circuit a set of characteristic signals from the DC electric signal;

generating with a control circuit first and second sets of control signals in response to the set of DC electric characteristic signals and a set of operational parameters, a voltage-frequency profile, and a set point parameter; and

inverting with a signal inversion circuit the DC electric signal in response to the first and second sets of control signals to generate a set of drive signals to modify the speed of the AC electric motor.

14 ~~25.~~ A variable drive system for controlling speed of an AC electric motor connected to a cyclic load, the system comprising:

a signal conversion circuit electrically connected to an alternating current source to convert a poly-phase AC power input from the alternating current source to a source of DC power on a DC bus;

a user interface circuit to receive a selected set of operational parameters, a selected voltage-frequency profile, and a selected torque set point;

a signal measurement circuit communicatively coupled to the control circuit for sensing DC current and voltage across the DC bus to provide a set of DC electric characteristic signals;

a control circuit responsive to the selected set of operational parameters, the selected voltage-frequency profile, the torque set point, and the set of DC electric characteristic signals, the control circuit generating a set of control signals to modify the speed of the AC electric motor according to a selected motor speed characteristic for different portions of a cycle of the cyclic load; and

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a signal inversion circuit electrically coupled to the DC bus and the AC electric motor to generate a set of variable frequency and variable voltage motor drive signals responsive to the set of control signals.